

Panel Discussion:

Role of High Risk Groups in Standard Derivation

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The recognition of high risk groups in the setting of occupational standards in the United States really appears to date from the establishment of OSHA of 1970 and the concomitant mandate for the development of criteria for Federal occupational exposure standards. Although the ACGIH recommended threshold limit values (TLV's) had been available as guidelines in increasing numbers since shortly after World War II, and these TLV's received legal endorsement by several individual states, the declared intent of the TLV's has always been to protect "nearly all workers" from adverse health effects. Explicit recognition is given to the Preface to the ACGIH TLV booklet each year, to the fact that "a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit; a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness." The preface goes on to point out that hypersusceptibility to certain industrial chemicals (respiratory irritants, hemolytic chemicals, organic isocyanates and carbon disulfide are cited as examples) can be detected by readily available simple tests, and that such tests "... may be used to screen out by appropriate job placement the hyperreactive worker. . . ."

In contrast, the philosophy behind the OSHA Standards is to protect "all workers" from adverse health effects over a working lifetime. Recognition of the existence of hypersusceptible or high risk groups with respect to certain chemical exposures (and possibly physical agents also) must therefore impact upon the development of standards which are intended to protect all workers. Refuge in the practice of screening out of hypersusceptibles from a work force with potential exposures to any particular agent is no longer officially condoned,

whether by preplacement tests or the commoner and time-honored method of allowing self-selection of the work force to take place with the passage of time.

The concept of hypersusceptibility as here applied is comprehensive and embraces such varied factors as constitutional idiosyncrasy, acquired immunologic hypersensitivity, genetically determined enzyme deficiency, the presence of predisposing chronic disease or impairment, age, sex, and physiologic predisposition. I also feel that it should include certain well-established life-style habits such as cigarette smoking (with respect to most inhaled carcinogens, especially asbestos) and heavy consumption of alcohol (with respect to carbon tetrachloride and possibly other hepatic toxicants).

One of the most clearcut and significant examples of this impact, already discussed in this session, is demonstrated by the basis of the recommended exposure standard for carbon monoxide. In recognition of the greater risk of adverse health effects run by persons with either incipient or overt ischemic heart disease and the high prevalence of this condition in the male working population, the NIOSH Criteria Document for carbon monoxide recommends a lowering of the present standard from 50 to 35 ppm as a time-weighted average. At the same time, this document concedes that even this standard may not be fully protective of the ischemic heart disease subject and therefore suggests counseling of known sufferers that "they may be at increased risk from occupational exposure to carbon monoxide." Now the Criteria Document for methylene chloride recommends a lowering of the standard from 200 ppm to 75 ppm as a TWA on the basis of its partial biodegradation to carbon monoxide in the human organism, and an attempt is made to derive the methylene chloride standard secondarily from the carbon monoxide standard already cited.

Another occupational standard of major significance where the recommended lowering is at least

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partly based upon the hyperreactivity of a sizeable proportion of the general population, variously estimated as from 20 to 30%, is that for sulfur dioxide. Here the hypersusceptibility seems to be based not on an incipient disease state but rather a prevalent and inherent constitutional state of hyperreactivity to the reflex bronchoconstrictor effect of the irritant gas.

I now want to hand over this topic for discussion by the panel by suggesting that perhaps the most problematic issue of all is the concept of all females of reproductive age as a high risk group, either directly or more plausibly as the potential bearers of the undoubtedly "hypersusceptible" embryo and fetus. Also recent unpleasant discoveries of the sterilizing propensities of DBCP and the suspicion of EDB should remind us that spermatogonia as well as ova may represent a high risk tissue.

Morton Corn*

It is appropriate that the final sessions of this conference focus on standards, because standards are the driving force of a regulatory effort, the distillation of whatever mechanisms for judgment of risk are operative in a society. Standards are the key to a future state of affairs if a society has seriously embarked on a course of either governmental or self regulation of occupational and environmental hazards. Although we are approaching the discussion here on the basis of separation of environmental and occupational hazards, the bulk of my remarks are applicable to both areas, but occupational standards will be used by way of illustration. Also, the following is in the context of U. S. regulatory policy in occupational health and safety; much may not translate to other societies, as will be evident. Ours is a highly commercial, technologically advanced, legalistic country with a complex structure of Federal, state and local government and a tradition of participatory government at all levels of jurisdiction. Because standards reflect the coming to terms of a society with the realities of that society, we must not expect that standards will be directly translatable to other societies. We are certainly observing the symptom of nations adopting, en masse, the occupational standards of other, more technologically advanced nations. It does not work; at best, we observe large discrepancies between the goals of the regulatory effort, as embodied in the standards, and the reality of conditions in the industrial environment in those nations.

The word "standard" is here used in the sense of a legally enforceable body of requirements which

must be met by those in responsible charge of workplaces. Because of the legal ramifications of standards, the standard-setting process must result in goals which are achievable by those legally charged with meeting them. Failure to do this results in lack of confidence in the standards, those drafting them and resistance to the enforcement process. Where guidelines, which are not legally binding, are involved, an entirely different set of circumstances applies. The usual result of unrealistic guidelines is that they are ignored by all concerned. They remain a scholarly ideal having little relationship to reality. Apparently, from all eyewitness accounts, Russian guidelines for the concentrations of substances in workplace air fall into this latter category.

Before presenting any views on the relationship of occupational standards to high risk groups, permit me to reiterate the ideas of William Lowrance in his book, *Of Acceptable Risk* (W. Kaufman Inc., Los Altos, 1976). The control of occupational hazards is an exercise in sorting out the risk associated with a particular agent or situation in relation to all the other risks we must accept as a part of our daily lives. Lowrance made a major contribution by differentiating between risk assessment, which is an empirical, scientific endeavor, and judgment of risk, which is a normative political exercise. In the U. S. it is the latter exercise which now leads to the proposal for, and promulgation of an occupational safety or health standard under the provisions of the Occupational Safety and Health Act.

Lowrance stresses that: "Safety is not measured; risks are measured. Only when those risks are weighed on the balance of social values can safety be judged: a thing is safe if its attendant risks are judged to be acceptable."

The mixing of these two activities, the assessment of risk and the judgment of risk in U. S. occupational health standards setting processes since 1971, has been the cause of much of the bitterness engendered in politically identifiable groups associated with occupational standards setting in the U.S. The confusion of these two activities by those charged with simple presentation of the regulatory machinery, as well as by those intent upon achieving often parochial results related to a single standard affecting the work environment, has confused the public and jeopardized the entire regulatory process. Because data are often insufficient to permit one to assess risk, the final recommendations of each individual concerned is a judgment of the acceptability of the risk and not a contribution to the assessment of the risk. However, it has not been couched in those terms in the formative steps of

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standards setting, such as hearing. The Occupational Safety and Health Agency has, in contrast, taken pains on many occasions to separate risk assessment from judgment of the acceptability of risk. The following quotation from the Coke Oven Emissions Standard illustrates the explicit nature of judgment of risk acceptability, which was made and which was sustained as reasonable and valid by the Third Circuit Court of Appeals when the standard was challenged by the American Iron and Steel Institute. "OSHA has determined that 150 $\mu\text{g}/\text{m}^3$ is the level which most adequately assures, to the extent feasible, the protection of coke oven workers. Several factors have been considered in making this determination and are discussed below."

The judgment of the risk acceptability will be challenged in the U.S. framework of government. The judgment of acceptability of occupational risks is a controversial exercise in regulatory government with often very expensive ramifications following from the final judgments. In the case of the Coke Oven Emissions Standard, the cost to the coking industry was estimated to be \$275 million per year. Of course, these costs will be passed on to U.S. citizens, but the differential impacts of these costs to individual employers within an industry, and to the industry in its international conduct of business cannot be ignored; the impacts are real and they stimulate intensive, sustained involvement of these sectors in the rulemaking. When faced with judgments which differ from those they would make if they were the regulators, the private sector or organized labor becomes the aggrieved party and presses for the judgment of risk by a third, objective party, i.e., the courts. OSHA undoubtedly still operates on the assumption in force during my tenure in office, namely, every standard will be challenged in the courts. The ultimate, ironic proof of this assumption may be the position taken by the AFL-CIO in their opposition to the selective removal of ineffective, nit-picking consensus safety standards adopted in haste in the early life of the Agency and

responsible for so much loss of Agency credibility, good will, and effectiveness. Certainly, OSHA did not anticipate that organized labor would be a grievous party in this endeavor.

With this introduction to risk assessment and judgment, we can now proceed to the process of standard setting in the U.S. The Congress in its wisdom intended, I believe; to separate risk assessment and risk judgment in the OSHA of 1970. NIOSH was to assess risk and OSHA in the standards setting process was to reflect the wishes of the body politic in judging the risk. The process was to be an open one with the widest possible participation of all in our society. In my opinion, the judgment of risk process has been open and, although hectic, has adhered to the aims of the Act. The risk assessment role assigned to NIOSH has not been satisfactorily performed. Research to generate the kinds of data needed to assess risk has not been stimulated or performed by the Institute. The criteria documents are citational reviews of existing information, seldom with a critical perspective, and never place the relative risk of the agent in perspective. The weaknesses of criteria documents has resulted in the mixing of risk assessment and judgment activities in the OSHA rulemaking process, making a difficult process of administrative rulemaking even more difficult!

The above discussion was an essential one to the position I now take. The majority of us are high risk individuals at work, in one sense or another during our lifetimes. Table 1 is part of the data cumulated by the American Public Health Association in their volume entitled, *Health and Work in America: A Chart Book* (APHA, Washington, D. C., 1975, p. 63). The topic we are discussing at this Conference is management of the conditions of work so that individuals are not stressed in a way that violates the best principles of preventive medicine. The question is how do we place and monitor individuals in work environments so that a risk judged to be unacceptable to that individual is not encountered.

Table 1. Currently employed persons with selected chronic conditions, by occupation: 1969-1972.^a

Condition	Rate/1000 persons/year				Total all occupations
	White collar	Blue collar	Service	Farm	
Arthritis (1969)	82.6	87.5	132.2	162.4	92.6
Chronic bronchitis (1970)	26.3	21.3	29.0	21.3	24.6
Impairment of back or spine (1971)	52.9	55.5	53.7	79.0	54.6
Heart condition (1972)	44.9	32.3	43.9	46.0	41.4
Hypertensive disease (1972)	64.5	61.6	93.8	63.5	67.1

^a Calculated from unpublished data from the Health Interview Survey, National Center for Health Statistics, U.S. Department of Health, Education and Welfare, Rockville, MD.

Can our standards act as a template for such management through medical and environmental surveillance, administrative and engineering controls, etc.? Can we build in surveillance methods that will identify those at high risk and can we devise administrative procedures acceptable to all concerned that reduce this risk? The issue of rate retention is an example of the latter procedures.

Figure 1 illustrates some guiding principles both in the assessment of risk and in the judgment of risk procedures. The graph is attributable to my predecessor at Pitt, Professor Theodore Hatch [Am. Ind. Hyg. Assoc. J. 23:1 (1962)]:

"In Figure 1 a distinction is made between impairment and disability, the two scales representing, respectively, the underlying disturbance of the system and the consequence of such disturbance in terms of identifiable disease. Starting with normal health, the individual progresses, for one reason or another, along the scale of impairment and of disability, ultimately to death. Early departures from health (impairment) are accompanied by little disability. In the beginning, normal homeostatic processes insure adequate adjustment to offset stress and for a distance beyond this early zone of change, compensatory processes similarly maintain the overall function of the system without serious disability. Further increments in impairment beyond the limits of compensatory processes, however, are accompanied by rapidly increasing increments in disability and the individual moves into the region of sickness and disability; terminating in death. A healthy individual, functioning at point A on the curve and subjected to a given kind and degree of stress may respond with relatively minor and temporary disturbance and will return to his underlying position when the stress is removed. An individual at point B, on the other hand, may find the same kind and degree of stress intolerable and, in consequence, move rapidly up the curve to a position of serious disability and even death. In our past concern with occupational diseases, relationships were established between conditions of exposure and degrees of disability and objectives were to bring the stresses of the job within limits to prevent such disability. For the future, concern must be with impairment, rather than disability, and relationships have to be demonstrated between the stresses of the job and the more subtle disturbances. The degree of impairment must be kept within limits well below the level of disease."

Much of this Conference has focused on measures of impairment at work and it is proper that this be done. This is part of the scientific base for measuring risk. When all of these data are put forth before the regulatory body charged with standard setting, they should be placed in as clear a perspective as possible. There is no certainty in these areas. The perception and judgment of acceptable risk, be it at the level of impairment, the trend of today, or disability, the focus of the past, is constantly altering, as was so beautifully summarized by my wife, Jacqueline, in a published paper entitled, *Historical Perspective to a Current Controversy on the Clinical Spectrum of Plumbism*" (J. K. Corn, Health and Society MMFQ, Winter 1975, p. 111):

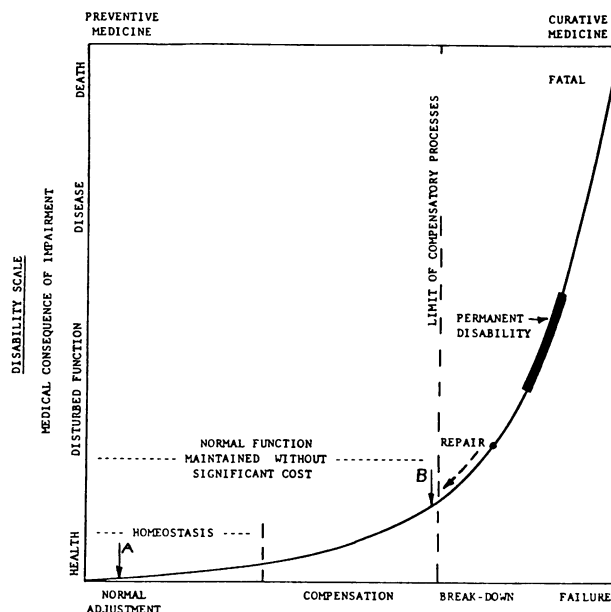


FIGURE 1. Suggested relationship between impairment and disability. Impairment increases with aging, as a residual of illness, and from excessive environmental stress.

"The significance of the history of plumbism up to this point is that an ancient disease once considered acceptable has been re-evaluated and become a serious medical, human, and social problem. This change of focus is based on new scientific data which have changed our perceptions of the earlier manifestations of lead poisoning on the health of industrial workers and the general population exposed to lead.

"The new uses of lead, new ability to make more accurate measurements, advances in biochemical science, and new attitudes towards the public health have all meshed to challenge the traditional concept of lead poisoning. In the dialogue that has been initiated between those who see a threat and those who do not, the concept of health risk and even the concept of disease itself are undergoing redefinition."

In other words, it is imperative to place all the available data related to risk in clear perspective. These data must relate to all the indicators associated with perception of risk and to the best of our ability to do so, the quantitation of the risk. All of us recognize that the data base in occupational health will have more omissions than inclusions for many years, because we all know the approximate agenda demanding regulation. But inadequate as it is, this is the procedure we must follow prior to judging the risk.

If the above argument is accepted, it is not possible to indicate, in any given judgment of a standard, which criteria should be adhered to by the regulatory agency. This is because there are some real constraints in the world and they must be factored into the consideration under discussion. The constraints I refer to are the following.

TECHNICAL FEASIBILITY. There are limits to technology. In many cases we are quite knowledgeable about the capability for existing engineering controls to limit exposure of workers to chemicals. Technology can be forced incrementally beyond these limits, but I believe it to be irresponsible for a regulatory agency such as OSHA to set an airborne standard for a chemical when it has no indication that the airborne concentration is achievable in practice. A regulatee would be well advised to seek third party review of a standard which asks him or her to do the impossible. I say this, recognizing that there will be risk to workers associated with the airborne exposure concentration associated with "best available control technology" (BACT). In these cases, one must invoke other, albeit less effective, methods for achieving lower exposures, i.e., personal protective equipment, administrative controls such as job rotation, etc. These procedures do not "freeze technology," as some have stated. It is always possible within our regulatory framework to revise the control strategy at some future date, once again through due process, to reduce the risk by the more direct avenue of BACT, when engineering advances applicable to the situation have occurred.

COSTS OF CONTROL. I have always believed it unrealistic and irresponsible to attempt to avoid preparation of cost figures for implementation of control efforts following from OSHA standards activity. Part of the judgment of risk is the weighing of the costs to reduce the risk. There is very little in our lives that does not have to withstand examination following from the question "What will it cost?" The irrelevance of the argument against cost considerations can be reduced to absurdity by placing a hypothetical dollar figure of \$20 billion/year on control costs for coke oven emissions. Would OSHA have promulgated the standard it promulgated under these conditions? Of course not. The Agency would have lost all credibility if it did so. Thus, there is a factoring in of dollars to risk judgment and it is foolish to argue that the wording of the OSHA of 1970 is in conflict with the consideration of costs of implementation. The argument is contrary to all our experiences. It will not hold up. Recent events related to the OSHA Cotton Dust Standard reaffirm the close coupling of dollar costs and data for scientific benefits to be achieved in the OSHA regulatory framework. The intimate connection between dollars and regulatory actions has been affirmed by the OSH Review Commission and the Courts. It is time to place these data for costs in as clear a perspective as possible, to accept their relevance to the act of judging risks and to focus on making judgments which will withstand scrutiny on

the basis of their judicious weighing of all relevant data.

I say this, fully cognizant of the argument that those who take the risks are not those who get the benefits. By building methods into reduction of risk which avoid the endpoints of disease or traumatic injury, namely, surveillance for early detection of impairment of function, use of methods short of engineering controls, management of susceptible persons with assurance of continued employment if removal from high risk jobs are necessary, effective control of risk and achievement of the goals of the OSHA of 1970 can be achieved. It was my observation that those individuals most vehement in their support of rigid positions to achieve the goals of the Act were often those least understanding of the scientific basis for toxicological action or control of the agents addressed in the standards. They were wedded to political postures independent of the data base and would, in the name of social progress, guide the Agency to unsupportable positions during the process of third party review.

In summary, I cannot offer a panacea consisting of rigid guidelines for incorporation of high risk group considerations into standards. All of the scientific data related to the risk undergoing assessment should be clearly stated; risk should then be stated in as many ways as possible in order to facilitate the judgment of risk by the regulatory body. I believe the generation of data for risk assessment must undergo quantum improvement in the near future; we are already regulating with a very slim data base. It is preferable, I believe, for separate bodies to do risk assessment and risk judgment, but this is not how we are currently approaching the matter. Only the rejuvenation of NIOSH will alter our current approach. The subjects of this conference are highly relevant to the data base because each of us, during our working lifetime, is at high risk in one regard or another. If the judgment of risk were my responsibility I would desire to see all available data, including cost data for control of risk to different levels. In the presence of these data, one can hope that judgment of risk would be defensible at some future date.

Finally, in certain cases where data are absolutely lacking, regulators must err on the side of prudence. This represents judgment of a real risk, but one which cannot be quantitated. Often such judgments are upheld because members of a society share a common perception of the risk. I believe the risk of cancer in our society is currently in this class of risks. We have in the past, and will probably in the future, judged all risks associated with cancer to be subject to some degree of control. Because the

data bases are often equivocal and the political factors are so significant, the judgments of risk appear illogical. Examples to contrast are that of cigarette smoke and saccharin control measures. Current control measures are roughly equivalent in the face of vastly different risks. The only unifying factor appears to be their vastly different potential to induce cancer. Society feedback did not sustain banning of saccharin, but it is endorsing appropriate labelling. The judgment of the risk of cigarette smoking is consonant with actions of mild labelling because it appears that society will not sustain more forceful action. These two cases clearly illustrate how the activities of assessment of risk and judgment of risk differ. In summary, one might say that regulators in their judgment of risk activity attempt to determine what "the traffic will bear" at a given point in time when action must be taken.

Bertram Dinman*

If we are interested in solving problems—and I suppose that's why we are all here, I think we can agree with one proposition, namely, in setting standards, one should attempt to set standards which are effective, prudent and feasible. Otherwise, we are faced with an inexorable law of political science which states that laws which are unrealistic are ineffectual. I think a good case in point of course was the Volstead Act, the so-called "great experiment." This is my point of departure on the continuum of logic, which, if you carefully follow, eventually comes full circle back to that conclusion.

As regards risk assessment and safety or risk judgment, it is important to differentiate between these two elements. William Lowrance (Of Acceptable Risk, W. Kaufman, Inc., Los Altos, Calif. 1976) has made a singular contribution to our appreciation of how society can rationally cope with the reality of risk, since risk is a reality of everyday life. It is important to differentiate clearly between risk assessment, which is quantifiable, which is scientific, which is empirical or data-based judgment. That stands in marked contrast to risk or safety judgment, which is a normative, political exercise in judgment in order to determine how much risk or safety is acceptable to society, and particularly to those who must face these risks, and ultimately acceptability, in its turn, is a function of cost, whether we wish to admit it or not. It is also a function of relative risk, i.e., compared to what? There is also a question as to who is to take the risk, as well as the need for reflection as to who is to benefit from a risk. In safety judgment these variables must be factored in.

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First, with regard to risk assessment, I quite agree with Dr. Kotin that more clarity of thought is needed regarding the terms we use in this area of risk assessment; assessment, in part, revolves about detecting and understanding change, particularly where biological change is the focus. I've spoken to this question in an article (Science 175: 495 1972) which I still believe is relevant. Although we are increasing our capabilities to detect changes or even effects in dose-effect relationship at the microgram, nanogram, picogram, femogram range (i.e., as low as 10^{-15} g). I think one has to be very careful as to what one means by effect or response. Going to Webster's International Dictionary, the English Language, Unabridged, I find the following: "an effect is something that is produced by an agent or cause, something that follows immediately from an antecedent." Similarly, the definition of response as in "dose-response" relationship, is "activity or inhibition of previous activity of an organism." In sum, effect or response both represent change without reference to whether this change is good, bad or indifferent. Curiously, in contrast to these neutral applications, somehow change per se, or response, or effect have come to be equated with "bad" or "deleterious." I do not find that to be a definitional actuality. And even without considering, even significantly, biology or statistics or communication theory, I cannot necessarily agree that effect or response is deleterious per se.

What is the basis for my position? It has been long known by physiologists that a living and viable, particularly with the emphasis upon "viable," organism or organ is functioning when it changes its state, responds to a stress. Indeed, it is clearly a necessity for that organ to do so unless we remain in a state of total environmental ablation. I have only to refer to experiments in total sensory deprivation and the devastating effect it has upon organismal function. Certainly the value and current perceptions of the value of placing graded stress on the heart and producing an effect or a response is scientifically and physiologically seen as nondeleterious, indeed, it is presumably seen as beneficial. In contrast, the well accepted value of such exercise, I find a curious dichotomy, i.e., any effect which is measured in bio-chemical terms, is not frequently seen as deleterious per se. For example, consider changes in δ -ALA dehydratase activity with lead exposure. That such a response might just as well be in the range of homeostasis appears unacceptable to many at this particular point in time. I wonder if this is not a reflection of Pavlovian biology. However, I would point out that even Senotsky is beginning to shift away from the concept that a change is

deleterious per se, in terms of reference of Pavlovian biology. I believe here is the problem, here is the crux, that risk assessment needs more thought and data; such thought is exemplified by Mort Corn's quote of Professor Hatch, especially to point is his emphasis on impairment which he defined as a departure from health, and I would agree with that. The dictionary states "impair is to do harm, do damage." Yet, when I discussed with him and with Professor Hatch over the years where harm or impairment lies on this curve of response, there is difficulty agreeing where homeostasis ends and when impairment begins.

So here we are back again to where we started: Is change within homeostatic limits deleterious per se? Rather than speculate, I believe a wealth of intellectual and societal challenge lie in this area. We do need more work here. I think another associated question that has to be answered is, "what are the long-term health implications of homeostatic change?" This gets to the heart of what we are really concerned with, i.e., the health implications of stressors, chemical or physical, on biochemical systems.

Still another question asks, "where is the dividing line between homeostasis and adaptation;" and we haven't heard the word adaptation as Clarence Cannon defined it, nor as Clarence Cannon described homeostasis sixty years ago. For indeed, there is a difference between adaptation and homeostasis, and I think this comes close to the questions we were bringing up at this moment.

Now, so much for risk assessment. As regards risk or safety judgment, remember this is a normative, political decision. Ultimately, societal decisions will hinge on an equation which factors in the following:

(1) Relative Risk. By this I indicate that a risk has meaning only as compared to what other risks do we willingly dare? And assuredly these start from the moment our feet touch the floor in the morning.

(2) What is the uncertainty in the assessment process?

(3) What are the benefits of the risk, particularly to those taking it and to their community? I don't mean just their community at large, I mean their own family.

(4) What is the acceptability, again to those taking the risk?

It is difficult to perceive as to the interaction of these four elements and their relative weightings. I would say on the basis of my own experience, that solution of this complex equation will be undertaken by society or of the people involved. Let me give you my basis for this position. In 1972 the

aluminum industry association commissioned a study of the mortality experience of smelter workers. Preliminary results of that study indicated that there was a somewhat increased risk, SMR's of approximately 150 (100 being the expected) for lung cancer in certain types of operations. At that point in time, management and the union agreed jointly to (1) lay out the risks for all the people involved; (2) get more definitive determination of risk as soon as possible; and (3) management indicated how they would protect both in the short and long term. Now with this threatening finding one would have expected considerable fear and dismay when the announcement was made. I must say I was somewhat surprised at the minor impact that news made. But with a little thought, it became clear to me that the affected employees were indeed carrying out their individual analyses of these difficult variables and their interactions. The experience also reassured me, as regards the common sense of our workers when given the facts, in contrast to some of the juvenile stridency of the self-appointed advocates.

From the practical problem solving point of view, I believe that representatives in the Joint Safety and Health Activity at each plant we can solve these problems. First of all, we've found we can work together to meet a mutual goal which is protection of safety and health of our workers. For there are prudent tradeoffs there. There's no way to negotiate away health. No increment of hourly rate can buy health. We had no problem, both management and labor, agreeing to this. Secondly, we are all faced with economic and competitive reality, and it is impossible to provide absolute protection. No one is asking for absolute protection. A categorical imperative, a total 100% guarantee for protection of "everyone" is just not attainable. Now in human history, aside from two hillside speeches—I speak of those which took place on the slopes of Mt. Sinai and on a mount overlooking the Galilee—I find very few categorical imperative constructs which have held up. The reality of this observation is confirmed by noting that, despite the fact that the Occupational Safety and Health Act states that all workers are to be protected, I do know that most of the congressmen and bureaucrats in Washington returning home to northern Virginia take the bridge to cross over the Potomac. It neither parts for their passage, nor can they walk on it dry shod.

Suffice to say, dealing with this mutual problem we have an option. We can enter the adversarial arena to solve our problem, or we can work toward solutions of problems by mutual information, mutual respect, and mutual negotiation. I would hold that the problems we have been discussing at this conference could soon, be solved in this fash-

ion. I would further hope that organized labor would engage more professionals, because even though I am trying to give my best version of what I believe is true, I would be much more comfortable if on the other side of the table as far as this particular area is concerned, labor had its competent representatives. When Dr. Lloyd left the Steel Workers I was very disappointed. I'm still glad to see that Mike Wright is here, but I would like to see more professionals like Lou Beliscy who is supposed to be on the panel.

I hope I have touched on those elements which define where I have been coming from as far as operational realities as regards to the problems associated with standards intended to protect the health of the workers.

Peter F. Infante*

I would like to comment on Dr. Corn's presentation and then make a few general comments. Dr. Corn had mentioned the desire to promulgate less controversial safety standards. Unfortunately, I believe that as long as there are special interest groups who introduce the concept of economics into scientific debate, there will be no opportunity for a scientific basis upon which risk assessment can be made. Under these conditions for risk assessment, science and economics always will be in conflict. As such, pretesting of chemicals prior to their introduction into the workplace is needed because, once the chemical is in commerce, it is too expensive for some to remove the exposure and it is too expensive for others not to have the exposure removed.

In terms of risk assessment, a few weeks ago I met with a group of scientists to determine the types of studies and the data required to indicate that a chemical poses a potential mutagenic risk to humans. Some members of the group made recommendations that certain tests were adequate if a chemical was not in commercial use. But, if a chemical was in commercial use, another set of criteria should be used to determine potential mutagenic risks. The rationale in the latter case being that if the compound was in commercial use, it may cost too much to eliminate the chemical from commerce, and therefore more tests should be required. One of these recommended tests would presumably take several years to complete, i.e., the specific locus test. I think this shows the problem of scientists confusing scientific judgment with economic considerations. If we're talking about a scientific assessment of data, we should not be doing what the economists seem to have difficulty

doing many times, i.e., economic risk assessment.

Dr. Corn also mentioned that standards are the key to a future state of affairs if a society has seriously embarked on a course of either governmental or self-regulation of occupational and environmental hazards. I certainly agree. Unfortunately, historical accounting would indicate that society, at least in the past, has not seriously regulated or controlled environmental hazards. This is obvious from the crises we've had in the past, that surface each year and that continue to become manifest. For example, with regard to benzidine, there were indications that this agent was carcinogenic as far back as 1895, when workers employed in a dye manufacturing plant had developed bladder cancer. Since that time there were epidemiologic studies up into the 1950's repeatedly indicating that benzidine was associated with bladder cancer and in some populations as high as 23%. For a population of workers in Italy exposed to benzidine and β -naphthylamine, almost 100% reportedly had developed bladder cancer, yet benzidine was not controlled as a carcinogen in the occupational setting in the U. S. until 1973. Benzene is another example of the long latency period between the identification of a risk and the implementation of adequate industrial engineering controls. Before the turn of the century, there were case reports indicating blood dyscrasias associated with exposure to benzene. In 1928, a case of benzene-related leukemia was first reported. Case report after case report throughout the world, wherever this material has been used, has indicated leukemia associated with benzene exposure in the occupational setting. Still, to this day, there is not adequate control of benzene in the U. S. in the occupational setting. Benzene also serves as a good example of an agent for which there is hypersusceptibility. As a clinical example, Dr. Aksoy testified at the OSHA hearings on benzene that he was aware of one worker who dipped whistles in benzene for 17 years and had no apparent adverse hematopoietic effects. His wife took the same job, and after four months of working alongside her husband, she had developed aplastic anemia with severe bone marrow degeneration. So, while certainly there is variability in response to toxic materials, the question of identifying the hypersusceptible group remains difficult, if not impossible.

In his presentation, Dr. Corn also mentioned that we're certainly observing the symptoms of nations adopting en masse the occupational standards of other more technologically advanced nations. Perhaps he could clarify that statement. I think there are problems with the international transport of toxic materials. At the meeting of fibrous and particulate matter held by the Society for Occupa-

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tional and Environmental Health last December in Washington, slides were shown of an American-owned facility just across the border into Mexico. Small children were peering through a fence that was entirely covered with asbestos fibers. If such exposure to a potent carcinogen is not acceptable in the United States, I would certainly hope that when an American-owned industry goes abroad, it would maintain adequate standards of safety and health. Of course we know this is not the case in the developing countries.

Dr. Corn also stated "safety is not measured; risks are measured. Only when those risks are weighed on the balance of societal values can safety be judged. A thing is safe if its attendant risks are judged to be acceptable." Now, I don't know that I can agree with the philosophy that a thing is safe if its attendant risks are judged acceptable, since these are, in many cases, societal, not scientific decisions. Perhaps we needlessly live with increased health risks because of a massive denial complex in the industrialized countries. When technological development is responsible for environmental insult, we have difficulty accepting that we have met the enemy and they are us. I don't think a toxic material should ever be considered safe. For example, when a standard of 1 ppm was established for vinyl chloride, it was never intended as a safe exposure, but rather an occupational exposure level that was agreed upon on the basis of engineering costs. I think it is of concern that Dr. Maltoni has recently induced mammary carcinomas with vinyl chloride at levels of 1 ppm and he indicates a dose response. Now, in terms of cost benefit and controversy, I think that vinyl chloride also serves as an example of the case in which there were many claims that the prices of plastic were going to skyrocket, plants would close, and numerous workers would be out of jobs; that simply didn't happen. I think there were very few plants that closed, approximately three polymerization facilities, give or take one or two, and most of these facilities were obsolete, having been built in the late thirties or early forties.

In terms of identifying populations at high risk to environmental chemicals, industry does select workers who are initially relatively healthy in comparison to the general population. This phenomenon has been demonstrated by mortality patterns from epidemiologic cohort studies, and is referred to as the "healthy worker effect." For example, if you calculate total mortality for workers within a period of 10-15 years since onset of employment and compare mortality experience to an age, sex, race, and calendar time-period adjusted standard population, a deficit in mortality will be observed. This is because the industrial cohort is compared to the gen-

eral population consisting of people who are relatively less employable due to various illnesses or chronic disabling conditions. However, after 20-25 years since onset of employment, this same group, rather than having a deficit of mortality, has an increased risk of mortality as compared to a standard population. So, relatively healthy workers are selected but nevertheless, workers are still at a greater risk of disease from exposures occurring in the occupational setting. In further regard to screening out hypersusceptible workers, how can workers be selected for an occupational exposure that demonstrates, as mentioned earlier, that almost 100% of the workers developed bladder cancer in a single plant.

Since there has been considerable discussion today about asbestos, it should be mentioned that recent estimates indicate several thousand cancer deaths a year in the United States will be attributed to asbestos exposure, alone. Since we've been discussing smoking and lung cancer, recent estimates also indicate that more than 20% of the increase in lung cancer in the past twenty years cannot be attributed to smoking. Likewise, recent studies indicate a 5- to 15-fold excessive risk of lung cancer in asbestos workers who do not smoke. In the past few years there has been a preoccupation with concern for an overcontrol of toxic materials. There is simply no basis for this concern, as an historical accounting, at least for carcinogens, demonstrates a devastating legacy in terms of toll on workers in the United States. This post hoc accounting can be demonstrated by the fact that we have been required to do epidemiological enumeration of the toll before regulation of any agent as a carcinogen.

In terms of genetic factors, we heard a presentation by Dr. Kilian indicating cytogenetic screening programs to determine whether there are any adverse effects in genetic material at the commencement of employment as indicated by the study of chromosomal damage in circulating lymphocytes. If such a screening program is used for hiring, for placing employees where they may not be exposed to chemicals that have known toxic effects, or to evaluate the effects of exposure to heretofore unknown potentially toxic materials, what happens if one later identifies an excess of chromosomal damage attributed to these employees occupational exposure to specific chemicals such as benzene or epichlorohydrin? What is the public health practice, or the medical implementation of the knowledge gained when such periodic screening programs detect hazards for which they were initially designed? What is the responsibility to the workers in this situation? Are the atmospheric exposure levels reduced? Are workers with elevated numbers of

chromosomal aberrations transferred out of the areas of benzene or epichlorohydrin exposure? Are they counseled in terms of genetic risks that may be potentially a problem if they are planning to procreate? Are they counseled in terms of somatic cell damage? These are questions that need to be addressed by any responsible organization, be it corporate, labor, or government.

Likewise, when assessing differential risk by sex, there are corporations that selectively do not expose women to various chemicals with no adequate scientific evidence that these chemicals selectively have an adverse effect on the developing embryo or fetus and not on male germinal tissue. Occupational health practice needs to be based on sound scientific data. Well designed studies to assess transplacental effects as well as to assess mutagenic and carcinogenic effects are needed. Otherwise, if women are excluded from exposure to specific industrial agents and men are allowed to sustain high level exposure to carcinogens and mutagens, a transferring of potential risks to the fetus and to subsequent generations through a different mechanism may be the result. We also may be transferring somatic cell damage from women to men, while women are presently outliving their male counterparts by 7 to 8 years.

In addition to the usual problems in the workplace and the vast number of toxic materials not adequately controlled, there has been a major crisis identified during each year of the past four years. Since this is a conference on increased susceptibility, I point up some of these adverse health situations as examples of different end-points manifesting a toxic response of chemical to workers. In 1974, vinyl chloride was demonstrated to cause cancer of the liver, lung, brain, and more recently to the lymphatic system in workers occupationally exposed to this toxic material. In 1975, the chlorinated hydrocarbon pesticide, kepone, was found to cause neurologic disorders in workers. In 1976, the organophosphate pesticide, leptophos, was found to cause delayed neurotoxicity in pesticide formulators. In 1977, an agricultural nematocide, dibromochloropropane, was found to cause sterility in workers in the pesticide industry. It is extremely important to identify individuals with increased susceptibility to disease from exposure to specific chemicals or work environs. However, it should be kept in mind how few endpoints in clinical disease can actually be predicted with the present state of knowledge. Workers are exposed simultaneously to multiple chemicals and numerous endpoints in clinical disease manifestation are possible. Thus,

with regard to a specific individual in the occupational setting, it would seem difficult to determine whether he or she would or would not be at an increased risk of disease when only one specific organ is evaluated in relation to one exposure variable at a time. This is particularly so as information indicates multiple organs can be affected as a result of exposure to a specific chemical. For example, even if adequate liver function tests could predict a relatively greater susceptibility for the hepatotoxic effects of vinyl chloride, cancer of the lung, brain, and lymphatic system as well as other adverse effects to most organ systems have been demonstrated. Therefore, the only effective medical screening program for hypersusceptible individuals would be one that would necessarily address simultaneously all organs systems. However, it would be more economically feasible to control occupational exposure than to adversely impact on an already overburdened health care delivery system in the United States.

Peggy Seminario*

I have a few comments on Dr. Corn's paper and a few comments of my own on occupational health standards for high risk populations. Dr. Corn stated in his paper that all individuals can be identified as high risk individuals at one point in life for one risk factor or another. I would agree with Dr. Corn that, in speaking of high risk populations in a general sense, we are in fact talking about significant numbers of individuals who may be at increased risk for a variety of different factors, whether it be sex, socioeconomic factors, or genetic factors. I would like to say that I believe that standards which fail to protect susceptible individuals are legally untenable for several reasons. Occupational health standards set at levels which fail to protect segments of the population who are at increased risks, would require the exclusion of these individuals from select jobs in the workplace. As we have seen in the lead industry and are beginning to see in the chemical industry, standards set at levels insufficient to protect the fetus have resulted in the blanket exclusion of all women of childbearing age from the workplace. These are policies and employment practices which are contrary to the requirements for equal employment opportunity and nondiscrimination set forth in Title VII of the Civil Rights Act. I don't think that we can talk about the screening of workers at high risk without talking about discrimination. I think that it is essential that occupational health standards for protecting workers be consistent with policies for equal employment opportunity. Further, as Dr. Dinman pointed out, it is the mandate of

* AFL-CIO.

the OSHA Act that health standards be set at the levels, to the extent feasible, that no worker suffer loss of function or material impairment. The Act also guarantees that all workers have a right to a safe and healthful place of employment. Note, the Act specifically guarantees protection to all workers, and not just nonsusceptible individuals. To date, most standards that have been set, have been set for carcinogens and the present activity of the Occupational Safety and Health Administration indicates that we can expect that standards for the control and regulation of carcinogens will continue to be a priority. For those substances which are carcinogens, we cannot guarantee safety even for those who are considered not susceptible. For those substances, we really cannot talk about the protection of susceptible workers, but rather we have to talk about the protection of all workers. Standards must be set at the level which, to the extent feasible, will assure the protection of all workers, and not just the nonsusceptible individuals. Dr. Corn has spent a considerable deal of time this afternoon addressing the subject of acceptable risk, trying to clear up some of the confusion regarding the subject. We have also heard remarks from other individuals on the concept of acceptable risks, pointing out that we do not live in a risk-free environment, and we cannot expect control to zero exposure levels in the workplace. Thus, it is argued that we must set standards at a level which reflects the level of risk which is acceptable to society. I would like to ask, how do we make those judgments as to what is socially acceptable? Further, these are levels which are socially acceptable to whom—the worker, who must accept the risk, or the employer who believes that the further reduction in exposure is too expensive to warrant the additional cost? I think the fundamental question is, who is to bear the cost? Is it the individual worker who may suffer impairment or disability or be unable to work in certain jobs, because exposures are too high? Or is the cost to be borne by the employer who has the legal responsibility to protect the worker? In considering socially acceptable risks and the cost of regulation, I think it's important for all of us to look at the costs of not regulating, the costs of non-compliance medical care such as disability benefits, workers' compensation costs, years of productive work that are lost. Only with consideration of these factors which are also true costs (i.e., the cost of noncompliance, the cost that will be borne by individuals and ultimately by society through tax burdens), can the true costs of regulation and non-

regulation be assessed. To put the costs of non-compliance into realistic perspective for at least one hazard, we only have to look at the yearly expenditures of half a billion dollars for black lung compensation paid to coal miners suffering from coal workers' pneumoconiosis. In addition to the permissible exposure levels set in health standards, I think other provisions of health standards are very important with respect to susceptible workers. Perhaps most important are the medical surveillance components of occupational safety and health standards. It is fair to say that, whether a worker is normal or hypersusceptible, there is a fear that the results of medical exams may be used in such a way that it may mean either job loss or loss of earnings for the impacted worker. Workers fearing either job loss or economic impact may refuse to participate in medical exams, exams which are clearly important for the protection of workers' health. And for hypersusceptible workers who may be screened out by the identification of an objective factor, I think the unwillingness to participate in such exams may be significant. For those workers who do participate in exams either by choice or by company policy, fear of job loss may cause individuals to withhold information on symptoms and health problems that need medical attention. For many years, the labor movement has fought very hard for the inclusion of earnings protection provisions in OSHA health standards. These provisions would guarantee full retention of earnings, seniority rights, and benefits for workers who must be removed from their jobs to protect their health. Such provisions are essential to stimulate participation in medical exams, exams which are necessary for the protection of the worker's health. Two other provisions within Occupational Health and Safety Standards are important with regards to hypersusceptible workers. Both of these deal with the informational aspects of health standards including access to information and training. It is essential that all workers be supplied with the results of environmental monitoring and the results of medical exams with an explanation of what those results mean to the individual worker. It is essential that workers know what levels of chemicals they are exposed to in the workplace. Adequate information on the toxic effects of substances and the appropriate control measures must be provided to individual workers. Training and education programs must address the hazards of toxic chemicals to all individuals, not just hypersusceptible workers.

General Discussion

HUGH EVANS (*Brooklyn Jewish Hospital*): There are three items I would like to bring up. As regards SAT and its applicability to industrial screening, I would like to call the group's attention to a series of publications from Canada which appear in the *American Review of Respiratory Diseases* of April '77 and April '78 which are the annual numbers that include all the abstracts that are submitted for presentation. You will see upon review of these documents that there really is no clearcut basis for screening, particularly as regards the MZ phenotype. I think this is an example, if I may say so, of the misapplication or at least the premature application of a procedure. I was reassured in speaking with Dr. Kilian that the Dow Company, which does do some of the screening, does not in fact, utilize the data to exclude individuals from any particular work situation, and I would urge that we take a very restrained attitude. The second item was very briefly alluded to at the end, and that is the absolute right of a patient or a subject to all the information derived from any sort of screening program. I found it rather disconcerting that an airline pilot, at least according to one of the discussants (see comments of Dr. Ashford), was not informed about a potentially lethal disease. Even if it had not been at that level of severity, I would hope that in June of 1978 that would not occur or from here on out that it would not occur. The third item pertains to the philosophy of the entire discussion this afternoon and some of the discussion this morning. I find it interesting that the whole crux seems to be in the area of physical disorder, physical disease. I get the impression that the beneficiaries, so to speak, of our concern are people working on assembly lines, people who are in the United Auto Workers, and Aluminum Workers, people in copper smelting and the like. I was wondering if either in terms of philosophy or implementation the concern ought not to include the white collar workers. Does it include or should it include government employees, the government itself being one of the largest employers in the United States? Does it include the health care industry, which is the fourth largest employer in the United States. In general, I wonder who sets the standards for those who set the standards. How did this all come about? If it is in the realm of normative political judgment to be concerned about hourly rated workers, is it not equally pertinent to be concerned about their employers. Who is interested in the health standards of the professors of pediatrics, for example, or the representatives who are sitting up at the table. I was pleased to hear that the Alcoa Corporation is in favor of at least two items in the oldest of texts; somewhere between these two there is a question of who watches the watchman and really this is what I'm asking.

MORTON CORN. I think it's quite clear under our system of regulation the legal authority for such action lies with the Secretary of Labor, who has transferred authority to the Assistant Secretary of Labor for OSHA. That organization is currently staffed at somewhere in the neighborhood of 2700 persons. It is incumbent upon the Assistant Secretary of Labor to set priorities and within the context of the United States problems, priorities for psychological and mental stress of white collar workers have been relatively low on the list. My reading of the Act suggests that authority is there as you know, other nations in the world have assigned a high priority to psychological stress on the job. But insofar as the regulatory apparatus is concerned, it has not been factored in, but it could be regulated at a future date.

This gives me an opportunity to respond to Peggy Seminario's point of who makes the judgments. Our system is also quite clear on that. The first judgments, the initial judgments, are made by the Assistant Secretary of Labor. Subsequent judgments are made by individuals who do not like that judgment and utilize the courts to reverse it. That is a unique and strong feature of our system of government. The courts are a very potent factor for social change and in our field they have been used in that way to

either prevent social change or to promote it in a direction differing from that which the regulator charged with authority has decided to go. For example, the administrator of OSHA utilized the wisdom of the Congress to enter premises for inspections and Mr. Barlow did not like that. Mr. Barlow took the right of entry without search warrant issue to the courts and won his case in the Supreme Court. We should not minimize the power of society, through third person review, to alter the judgment of those charged through our representative government with the initial judgmental factors.

There was a question on my overseas comment in the previous discussion. Let me elucidate this. We have many students from other countries, many of them now physicians of great responsibility. They adopt en masse the OSHA standards and the TLVs and they can't enforce them; they can't implement them. The standards are on the books in a country like Peru, with a 25% prevalence figure for silicosis among miners. They have our standard for free silica in air. It was that rapid incorporation of our standards for purposes of respectability, without a realistic judgment of what is achievable in those countries, that destroys the credibility of their own agencies. I was not speaking against standards in those countries, but it is perfectly conceivable to me that Peru is going to have to walk before it runs with respect to control of free silica. Peru will experience an incremental process of lowering its standards as it gets on top of the problem. Many of the developing nations of Africa, I am told, are adopting all of our standards. Many African nations do not know how to measure the agents they are adopting standards to regulate. I was referring to this phenomenon in my remarks, not to an absence of standards.

As to third point, what is safe? That is a societal judgment. I personally disagree with many societal judgments. I'm very fearful of driving during rush hour and do my best to avoid ever getting in a car during rush hour, but society has judged the injury and death tolls on our roads to be an acceptable price to pay for our transportation. I try to minimize my exposure by driving during the periods of lower risk. So the judgments are made in that case, by our regulator through the traffic association, and the individual has a right to minimize the risk from the societal judgment, but I am by no means advocating we all agree with the societal judgment.

MICHAEL WRIGHT (*United Steel Workers of America*): I have just a couple of comments. One is stimulated by what Dr. Corn just said. I think it's a misstatement to say that many foreign operations, especially mines in Latin America, cannot meet United States standards. I think it is more accurate to say that they are not interested in meeting United States standards. Certainly the technology is available, certainly the profits are immense from those operations, and certainly controls can be installed by the ownership. In fact, many of those owners are U. S. corporations.

Second, let me say that I found the panelists' comments on risk-benefit analysis interesting and provocative, but somewhat off the point of what we were supposed to discuss, which was high risk groups and occupational standards. There's a position on one side where we say we "protect everybody," on the other side where we say "identify and screen out hypersusceptible workers and don't worry about protecting them, because they're no longer in the work population." Where do you draw the line? For people with Wilson's Disease, which has a prevalence of, say, 1 in 200,000, I wouldn't have any trouble with keeping them out of a copper smelter and I wouldn't say that the Federal Standards for copper ought to be based on people with Wilson's Disease. On the other hand, I think NIOSH has taken the position that, in effect, the federal standard for carbon monoxide should be based on those people with at least a degree of ischemic heart disease. There prevalence in the working population is very high. It would be ineffective, unfair, and socially

disruptive to try to screen them out of exposure to carbon monoxide. The question is, where do you draw the line? I think we discussed that same point this morning. This morning we were talking about whether a company should screen some workers out? This afternoon we were talking about whether OSHA should screen them out by setting a standard that does not protect them. Organized labor is very apprehensive of that kind of screening, whether it's done by a company or through the use of an OSHA standard. We would be much less apprehensive if three conditions were met. Those three conditions are: first, the screening must be accurate, valid, and must really identify high risk groups. I haven't seen much evidence that this is true for most of the genetic factors we discussed yesterday. The second criterion is that a screening program must not be used to deny protection to so-called "non-susceptibles." Every time we talk about identifying a susceptible group we are in effect saying there is another group which is "nonsusceptible," or more accurately "less susceptible." But they may still have appreciable risks. Will a screening program be used as an excuse to avoid cleaning up the workplace? Finally, we must be willing to guarantee employment to those workers who are screened out. Are we willing to guarantee those people full earnings protection and jobs? And what about people not currently employed, but entering a pre-employment screening program. Are we willing to guarantee those people equal access to job opportunities?

So far, the evidence that industry and the government are willing to do those things is not good. Until we see some evidence that the screening programs are effective, that they will not be used to deny "less susceptible" workers safe workplaces, that people screened out will have full earnings protection and equal access to jobs, we are going to resist these programs, and rightly so.

BERTRAM DINMAN (Alcoa): First of all, I'll not respond in a reverse fashion since the last question spoken to revolves about the matter of rate retention. First of all, if I have a thousand people in an audience, the odds are that there are going to be one saint, 50 scoundrels, and the rest of the population's behavior being somewhere in between. Well, 50 scoundrels is about 5%; I guess what I'm saying is that there's going to be a total spectrum of behavior across my total population sample. I would say the same thing of any corporation. There are scoundrels and there are saints. I would say the same thing about unions. There are some scoundrels we all know and there are some saints. Now for most of the people in between, I would only say that in collective bargaining we have looked at the question of rate retention and we jointly agreed with our unions that if an individual is screened out of the job because of some change in the employee which was a result of the job exposure we will agree to abide by rate retention. They will not lose any money in terms of remuneration because of their being taken out. We agree that it's our responsibility. Obviously I can speak only for Alcoa but that's where we are. So one should not generalize and say that it's not going to be done, because it is being done and right now. As for protection of nonsusceptibles, I have no question about that. There's no excuse for saying to the work force that since this population probably does not contain susceptibles, we'll leave the work place sloppy and a potential risk for every one of these individuals. I don't think one has a license to pollute the workplace on any grounds anyway.

As far as the effectiveness of screening, when I came to this conference I thought perhaps the question might arise as to

G6PD possibilities or SAT possibilities. Yet I know that some corporations who tried to do screening of the SAT factor found it to be totally nonproductive. What we're saying, in effect, is that the number of individuals who possibly might be screened out was so miniscule, if they existed at all, that the process was not worthwhile. Ultimately, I find myself in a difficult position to respond to the question: "Do you have a policy?" How in the blazes can I develop a policy for relatively few people. Policy, as I understand it, is a process instituted for large numbers of individuals who may become involved in some question in order to insure equity to the greater numbers of persons involved. Policy should provide some consistent fashion for dealing with this problem and the many people involved. If I have a few people affected by a certain problem, however, I am not going to set up policy, since I don't think that to try to force an individual into a mold of a "policy" does that individual justice, and it only ineffectively solves the problem.

Finally, as to the effectiveness of screening, I think the example of CO and the latent heart disease which should be expected in the male over 45 is relevant. One should go back to the original data upon which these screening responses are based. I refer to the Aronow and to the Anderson studies; in both cases, the precipitation of EKG changes and precipitation of angina were in patients who had clinically preexisting detectable angina. Now, that is not very subtle screening. I wouldn't want to base any determinations and standards upon such a population. I don't think that such screenings are effective. I quite agree that there are not many screening methods that we have which are effective. So to take action on that basis, I find to be an exercise in futility at this point in time.

JONATHAN KING (MIT): I'm sure everybody's aware that OSHA's trying to get generic standards for carcinogens. There are hearings going on in Washington, and of course there has been quite a lot of opposition to generic standards for carcinogens because for some people this would be quite expensive. It's also true that one has heard the argument put forward, "Well, there really are certain cancers that are due to genetic susceptibility and it's not due to exposure to carcinogens." And those arguments have been put out. Second, I'd like to take from my own experience in certain controversial genetic screening issues, in particular, the screening of newborn infants for an extra Y chromosome to see if they grow up to be criminals. In numerous cases where there was a scientific discussion but no data were shown establishing the correlation. And then one would see three months later the report, "Scientists Show Relationship Between Chromosome and Criminality." I'm sure a number of us have seen articles suggesting a genetic basis for susceptibility to disease which don't have such a base. Given the environment, I'd like to propose a mild resolution on this for those of us here, given that we are in the middle of the process of getting a standard for carcinogens. I resolve that as scientists and administrators concerned with protecting health we recognize the importance of investigating susceptibility to pollutants within different occupational, social, and age groups. However, we want to affirm the importance of lowering the exposure to noxious materials to all members of the society, and to this end the efforts of OSHA and EPA for developing generic standards for carcinogens and toxic substances. I think in this area we really are the critical scientific population. If we very clearly support the efforts of governmental agencies to lower exposure to toxic materials this could be significant.